

workplace exposures. The prevention of attacks in people who already have asthma will be discussed by Dr Pierce.

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DON CAMPBELL

WHO GETS ASTHMA? WHO DIES FROM IT?

Summary

The prevalence of asthma in Australia has risen in recent years. The prevalence of current asthma in South Australia rose from 5.6% to 9.0% between 1987 and 1990. In 1994 the cumulative prevalence of asthma in the Australian population was 15.3%. Studies of asthma prevalence in 8- to 11-year-olds conducted in the same community demonstrate a rise in prevalence of current asthma from 6.5% to 9.9% between 1982 and 1992, and a rise in the cumulative prevalence of diagnosed asthma from 12.9% to 19.3%.

Genetic factors are important in the development of asthma and atopy, however environmental factors appear to be crucial to the onset and persistence of asthma. These factors include changes in the indoor levels of house dust mite, levels of oxides of nitrogen and possibly diet (oily fish intake). Up to two-thirds of asthmatic children

continue to suffer from asthma through puberty and into adult life. Five to 10% of children with mild asthma are likely to develop severe asthma in later life. Children with moderate to severe asthma are at risk of long-term effects of asthma throughout life.

The age-adjusted asthma mortality rate in Australia increased from 2.7/100 000 in 1971 to 4.85 in 1989, declining to 3.53 in 1992. Between 1981 and 1992, for the very young (<15 years) the mortality rate was very low (<1/100 000) with little evidence of a change. For intermediate age ranges there was evidence of an initial rise and a subsequent reduction in mortality rates, whilst in the elderly mortality rates from asthma continue to rise. The positive predictive value of death certification due to asthma is very accurate in the under 55 age group, whilst in the over 64 age group the death certificate is not current enough to be used for epidemiological purposes.

Causative factors to explain the rise in mortality due to asthma may include the increased size of the at-risk population (prevalence), or a change in the severity of asthma. Detailed analyses indicate a large burden of preventable mortality due to asthma which reflects poor management including failure to recognise the severity of asthma, failure to manage asthma appropriately and poor compliance with asthma management plans.

Definition

'Asthma is a chronic inflammatory disorder of the airways in which many cells play a role. In susceptible individuals this inflammation causes symptoms which are usually associated with widespread but variable air-flow obstruction that is often reversible either spontaneously or with treatment. It also causes an associated increase in airway responsiveness to a variety of stimuli.'

From the international consensus report on diagnosis and treatment of asthma, 1992.

1. Prevalence of asthma

The prevalence of asthma in Australia has risen in recent years. The prevalence of current asthma in South Australia rose from 5.6% to 9.0% between 1987 and 1990. In 1992 the prevalence of current asthma in Victorian adults was shown to be 7%. In 1994 the cumulative prevalence of asthma in the Australian adult population was 15.3%.

Studies of asthma prevalence in 8- to 11-year-olds repeated in the same community demonstrate a rise in prevalence of current asthma from 6.5% to 9.9% between 1982 and 1992, and a rise in the cumulative prevalence of diagnosed asthma from 12.9% to 19.3%. In a study of the prevalence of respiratory symptoms in South Australian pre-school children in 1993 the cumulative prevalence of asthma was 22.5%. This figure compares with the estimated prevalence of 17.1% in primary school age children across Sydney, Melbourne, Brisbane and the Upper Hunter Valley from 1992.

II. Factors associated with the acquisition of asthma

Genetic factors are important in the development of asthma and atopy, however environmental factors appear to be crucial to the onset and persistence of asthma.

Up to two-thirds of asthmatic children continue to suffer from asthma through puberty and into adult life. Five to 10% of children with mild asthma are likely to develop severe asthma in later life. Children with moderate to severe asthma are at risk of long-term effects of asthma throughout life.

In 1968 a survey of all 7-year-olds in Tasmania was conducted, 85 855 children born in 1961 were surveyed, being 99% of the population. The cumulative prevalence of asthma was 19.0%.

A history of asthma was significantly associated with:

- (i) the child being male (OR 1.56);
- (ii) having an atopic background (OR 3.86 for hay fever);
- (iii) having a family history of asthma (OR 2.63) this effect being additive on a log scale;
- (iv) mother being a smoker (OR 1.26).

The familial aggregation of asthma is consistent with a genetic etiology, but also a shared environment.

As part of the study of the prevalence of respiratory symptoms in South Australian pre-school children, the relationship between prevalence of respiratory symptoms and indoor air quality was examined. Using a logarithmic regression analysis, the following factors were significantly associated with increased risk of asthma:

- (i) natural gas stove compared with an electric stove (OR 1.24);
- (ii) the use of a non-flued gas heater compared with other heating (OR 1.26).

Parental smoking was significantly associated

with increased prevalence rates for bronchitis and ever having wheezed (OR 1.21 and 1.24).

Socio-economic status was not associated with prevalence rates for asthma.

Studies to examine the effect of environmental exposure upon the expression of asthma in children have included:

- (i) the study of the effect of allergic sensitisation and climate upon the expression of asthma in children aged 8 to 11 years in seven climatic regions in New South Wales. In all regions the prevalence of current asthma was high (24 to 30%). The prevalence of current asthma was higher in 3 coastal regions where sensitisation to house dust mites was high, and in the far west of the state where sensitisation to *Alternaria* was high, compared with the prevalence in three inland regions where the sensitisation to these allergens was lower;
- (ii) a study of school aged children in Sydney where sensitisation to house dust mite was shown to be a particularly important risk factor for both airway hyperreactivity and current asthma in Sydney schoolchildren. Children with large skin test reactions to house dust mite allergen were shown to be the group at greatest risk for morbidity affecting lifestyle.

The author suggests that measures to reduce the level of house dust mite in indoor air quality may have an effect upon the rate of sensitisation to house dust mite and of development of asthma.

In an interesting study of asthma and atopy in South-East Asian immigrants in Melbourne, Leung et al. (1994) found that Asian immigrants and Australian born Asians had a higher rate of atopy than in Australians, and that Asians were twice as likely to react to pollens than Australians and 1.5 times as likely to react to dust mite. Pollen reactors had a 4.8-fold increase risk for development of hay fever, and house dust mite monoreactors a 4.5-fold risk of wheeze or asthma. The prevalence of hay fever in Asian immigrants increased significantly with duration of stay in Australia, a lesser association was seen in duration of stay in Australia for asthma.

III. The epidemiology of asthma mortality in Australia

The age adjusted asthma mortality rate in Australia increased from 2.7/100 000 in 1971 to 4.85 in 1989, declining to 3.43 in 1992. Between 1981 and 1992, for the very young (<15 years) the mortality rate was very low (<1/100 000) with little evidence of a change. For intermediate age ranges there

was evidence of an initial rise and a subsequent reduction in mortality rates, whilst in the elderly mortality rates from asthma continue to rise.

The positive predictive value of death certification due to asthma is very accurate in the under 55 age group, whilst in the over 64 years age group the death certificate is not accurate enough to be used for epidemiological purposes.

Where death certificates mentioned asthma but did not code the death as being due to asthma there was an excess of deaths attributable to diseases of the circulatory system and respiratory system, in the latter category chiefly due to chronic obstructive airways disease.

Thus Australian data points to the difficulty of distinguishing between asthma and other causes of chronic obstructive airways disease as potential causes of death in the older age groups.

IV. *What are the features of asthmatics dying of asthma?*

Causative factors to explain the rise in mortality due to asthma may include the increased size of the at-risk population (prevalence), or a change in the severity of asthma. Detailed analyses indicate a large burden of preventable mortality due to asthma which reflects poor management including failure to recognise the severity of asthma, failure to manage asthma appropriately and poor compliance with asthma management plans.

A principal objective of the South Australian Asthma Mortality Study was to test whether cases dying of asthma and asthmatics experiencing near fatal attacks (NFAs) were similar with regard to: their personal and psychiatric characteristics; their asthma histories and asthma severity; features of medical and personal management; circumstances surrounding the fatal or near-fatal episode; and whether the episode could have been prevented.

The study period was from May 1988 to June 1991. Persons dying in South Australia during this period were enrolled in the study if 'asthma', 'asthmatic' or 'status asthmaticus' was recorded in Part I or II of the death certificate. The death certificates then were reviewed and if the death *may* have been due to asthma, the certifying doctor was interviewed concerning the circumstances surrounding the death. Interviews were then held with the cases' general practitioners, allied health professionals and household or other close acquaintances.

During the same period, NFA cases presenting to accident and emergency departments of Adelaide teaching hospitals were recruited. To be eligible

for entry into the study, cases had to have experienced asthma resulting in either respiratory arrest, or a PaCO₂ above 50 mmHg and/or an altered conscious state or inability to speak on presentation to hospital. Interviews of an identical format to those for death cases were held with household or other close acquaintances and general medical practitioners.

This study shows that asthmatics dying from asthma share many important similarities with those asthmatics who survive a near-fatal attack. This applies to: the severity of their asthma; the frequency of asthma symptoms; the impact of asthma on school or work attendance; histories of asthma episodes leading to visits to hospital accident and emergency departments, general hospital admissions and admission to intensive care units; the type of primary health care provider; histories of lung-function testing; use of crisis plans; compliance with prescribed medication; and quality of medical management. Help-seeking behaviour during the fatal or near-fatal episode appeared to be similar and histories of previous psychiatric consultation and levels of psychiatric caseness were also similar.

The asthma death and NFA cases included in the present study were not similar in all respects. NFA cases tended to be younger, to include more males, to be less likely to have concurrent medical conditions, to be more likely to have high levels of denial, to have made fewer doctor visits for asthma in the 12 months prior to the attack, and to have made less use of asthma medications in general.

There were 80 cases in the asthma death group and 154 cases in the NFA group. The death cases were significantly older (mean age 52.3 years, and for the near-fatal attack group 36.1 years). Males comprised 39% of deaths and 57% of the NFA group. These differences were significant.

The levels of asthma severity found in this study were similar to those found in previous studies; 73% of asthma death cases and 65% of NFA cases were classified as having severe asthma, compared with 65% who were assessed as having severe asthma in the Victorian asthma mortality study conducted in 1986.

In the present study, 39% of asthma death cases and 45% of NFA cases were reported as having been admitted to hospital in the preceding 12 months, compared with 39% of cases reported to have been admitted in the preceding 12 month period in both the New Zealand and Victorian asthma mortality studies. A history of admission for asthma in the preceding 12 months has been reported to be the strongest single indicator of

risk for subsequent death from asthma, and is also an indicator of subsequent risk for readmission.

The Victorian asthma mortality study reported that 65% of cases ($n = 193$) had been provided with an appropriate asthma management plan, compared with 37% of asthma death cases and 49% of NFA cases in the present South Australian asthma mortality study. Only 31% of asthma death cases and 38% of NFA cases were reported as having used a peak flow meter at home, which is not significantly different from the proportion (31%) previously reported amongst asthmatics attending accident and emergency departments in 1992. Only 13 of 163 cases were reported to have had a peak expiratory flow meter in the Victorian asthma mortality study performed in 1986.

Prior medical management was assessed as optimal in only 25% of asthma death and NFA cases combined, with no significant difference between the two groups, on the basis of a consensus opinion of a reviewing committee. The perception of the quality of the medical management was extremely difficult to distinguish, however, from the quality of personal asthma management. Individual self management was assessed as poor for 53% of asthma death cases and 67% of NFA cases. However, when the analysis was restricted to subjects aged less than 60 years, similar levels of poor self management were seen for both groups. Reported compliance with prescribed medication from general practitioner reports was similar for the two groups (69% and 58% respectively).

That 53% of asthma death cases and 45% of NFA cases in the present study were regularly using beta agonists without concomitant preventive medication gives cause for concern. The corresponding figure for the Victorian asthma mortality study was 41%. Regular use of oral corticosteroids were reported for 26% of the asthma death and 16% of the NFA cases, with a figure of 16% also applying in the Victorian asthma mortality study, compared with 42% in the New Zealand study from the early 1980s and 69% in the British study from the late 1970s.

Reportedly, 16% of asthma death cases and 24% of NFA cases had purchased medications (inhaled beta agonists) directly from the pharmacist without a doctor's prescription. Asthmatics who purchase beta agonists directly from the pharmacist have been shown to be less likely to consult with family doctors and also less likely to use prescription-only medication. The high rate of repeat purchase of asthma medication on prescription without further medical consultation, as observed for asthma death (24%) and NFA

cases (42%), suggests that an opportunity for regular review and education regarding appropriate asthma treatment is not being utilised for asthmatics who have clearly experienced high levels of prior morbidity due to asthma.

Delay in seeking medical care was a feature of the final event for 56% of asthma deaths and 58% of NFA cases. Delay in receiving medical care was more common in the asthma death group than the NFA group. Amongst those cases where the final event was considered either definitely or probably preventable, delay in actually receiving medical care and less ready access to acute medical care distinguished death cases from NFA cases.

Asthma education will need to provide asthmatics with skills to recognise deteriorating control of asthma, and with appropriate strategies to manage the deterioration. At present, many asthmatics appear just to increase the use of inhaled beta agonist therapy, adopting a 'wait and see' approach hoping the situation will improve. It is of concern that in response to increased asthma symptoms only 20% of asthma death and NFA cases were reported to have increased use of oral corticosteroid medication in the prior 12 months, while over 80% of cases in both groups had increased the use of beta agonists.

Overall, 22% of asthma deaths in the present study were assessed as definitely having preventable factors associated, and 8% of the NFA cases were so assessed, compared with 37% of 126 asthma death cases which were assessed as definitely preventable in the Victorian study. Almost two-thirds (62%) of asthma death cases in the present study were considered definitely or probably preventable, compared with 61% of 271 cases in the New Zealand asthma mortality study, and 86% of 90 cases in the British study. A higher proportion of NFA cases (83%) was assessed as having preventable factors definitely or probably present, possibly reflecting the lower incidence of end-stage asthma in this younger group.

Reference

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R. J. PIERCE

ASTHMA PREVENTION AND TREATMENT

Asthma is a disease of the airways—the branching system of tubes through which we draw air into the lungs, where exchange of oxygen and carbon